En Bloc Perfluorodissection in Vitreoretinal Surgery

A new surgical technique for tractional retinal detachment.

BY J. FERNANDO AREVALO, MD, FACS

En bloc dissection, delamination, segmentation, and bimanual surgical technique represent advances in the surgical treatment of severe proliferative diabetic retinopathy (PDR) and other vitreoretinal conditions including uveitic vitreoretinal complications. Viscodissection, first described by Stenkula and Tornquist, is a surgical dissection technique that facilitates removal of epiretinal membranes. It is performed by injecting viscoelastic substances between the retina and epiretinal tissue to separate the epiretinal tissue from the subjacent retina.

In 1987, Chang et al introduced the use of perfluorocarbon liquids (PFCL; perfluoro-n-octane) as an intraoperative tool in vitreoretinal surgery. Following US Food and Drug Administration (FDA) approval of PFCL as a surgical tool, PFCL gained wide acceptance for the management of retinal detachment with proliferative vitreoretinopathy (PVR), diabetic tractional retinal detachments, giant retinal tears, retinopathy of prematurity, endophthalmitis, dislocated crystalline lenses, ocular trauma, intraocular foreign bodies, repositioning of dislocated IOLs, surgical excision of subretinal membranes, and control of intraoperative hemorrhage.

In a previous study, Quiroz-Mercado et al found that perfluorocarbon-perfused vitrectomy (PCPV, PFCL in continuous infusion) may be a useful technique for the following reasons: (1) the high oxygen-carrying capacity of PCL could be useful during surgery for an ischemic retina (eg, severe diabetic retinopathy); (2) oxygen affinity might facilitate elevation of intraocular pressure (IOP), allowing hemorrhage-free surgery; (3) the immiscibility of PCL with blood and debris might facilitate surgery and improve surgical efficiency; and (4) gravitational forces may help to reattach and stabilize the retina during vitrectomy and membrane peeling. Despite its advantages, the use of PCPV has not gained wide popularity. PCPV also has disadvantages, including the use of a considerable amount of PCL, and the fact that PCL may push membranes against the retina.

I have recently described a new surgical technique called “en bloc perfluorodissection” (EBPFD) that facilitates removal of epiretinal membranes and the posterior hyaloid. It is performed by injecting PCL between the retina and the posterior hyaloid to separate the epiretinal tissues from the subjacent retina.

SURGICAL TECHNIQUE

A standard three-port pars plana vitrectomy (PPV) is performed to clear any vitreous hemorrhage or vitritis present. Three 1-mm-wide sclerotomies are made using a microvitreoretinal blade from 2.5 to 3.5 mm posterior to the limbus. The infusion line is sutured in the inferotemporal quadrant. When necessary, a circumferential 2.5-mm...
scleral band is sutured with the posterior border located 12 mm posterior to the limbus. Endolaser is performed using an argon (green only) laser; cryotherapy is performed when needed. Nonilluminated instrumentation is employed combined with a noncontact wide-angle viewing system (Biom; Oculus, Wetzlar, Germany). Bimanual illuminated instrumentation is not used; rather, an illuminated infusion cannula is used (Illuminated Infusion Cannula; DORC International, Rotterdam, The Netherlands).

A hole is made in the midperipheral posterior hyaloid and PCL (perfluorooctane [C8F18], Perfluoron; Alcon Laboratories Inc., Fort Worth, TX) is injected to mechanically and slowly separate the posterior hyaloid from the retina (Figure 1 A-C). We use a viscodissector (Vitro Retinal Viscodissector; ASICO, Westmont, IL) with a 20-gauge x 1-inch cannula with a 30-gauge x 3/16-inch tip extension attached to a 5-cc syringe filled with PCL to separate membranes from the underlying retina. Once all the epiretinal tissues have been separated from the retina, vitrectomy is completed. (E) Endolaser is applied under PCL. (F) A fluid-air exchange is performed, followed by an air-gas exchange using a 60-cc syringe of 14% C3F8.

**PRELIMINARY RESULTS**

I have performed EBPFD in more than 100 tractional retinal detachment (TRD) cases of various etiologies. In this article, I review my first 40 eyes (40 patients) in which EBPFD was performed during vitrectomy for TRD in severe PDR (30 eyes) and ocular toxocariasis (10 eyes). The mean age of patients was 42 years (range: 3 to 84 years). We have followed our group of patients for a mean of 16 months (range: 6 to 24 months).

Each patient underwent best corrected visual acuity (BCVA) measurement with ETDRS charts and ophthalmic examination including slit-lamp biomicroscopy. Patients were examined at 1 day, 1 week, 2 weeks, and 1 month after surgery and every 3 months thereafter. At each visit, a complete eye examination was performed, including BCVA, slit-lamp examination, intraocular pressure measurement, and stereoscopic biomicroscopy of the retina. An increase or decrease in BCVA was considered to have occurred if there was a change of two or more ETDRS lines. Patients were included in this consecutive series only if there was a minimum of 6-months follow-up. Main outcome measures included changes in BCVA and retinal reattachment.

The mean surgical time was 50 minutes (range: 40 to 75 minutes). No patient developed ocular hypertension or undue inflammation. Complete retinal reattachment (accompanied by visual improvement [≥2 ETDRS lines] in 70% [28/40]) occurred in 100% of eyes. In nine eyes (22.5%), BCVA remained stable and in three eyes (7.5%) BCVA decreased (≥2 ETDRS lines). Final BCVA was 20/50 or better in 25% of patients, between 20/63 and 20/200 in 47%, and worse than 20/200 in 28%. Conventional dissection with pick and scissors was necessary in seven (17.5%) eyes. Complications included phthisis bulbi in one (4%) eye, iatrogenic retinal breaks in four (10%) eyes, vitreous hemorrhage requiring another procedure in four (10%) eyes, and cataract in eight (20%) eyes. Iatrogenic retinal breaks were associated with the need for conventional dissection when membranes were very adherent to the retina. No retinal breaks occurred during the injection of PFCL, and there was no subretinal PFCL associated with the retinal breaks. All eyes had the retina attached at last follow-up.

**FINAL CONSIDERATIONS**

En bloc perfluorodissection using a limited amount (mean: 4 mL) of PFCL may be a useful technique during vitrectomy in eyes with TRD in PDR and ocular toxocariasis. With proper selection of patients and techniques, anatomic (100%) and functional success (70%) can be achieved. Advantages of en bloc perfluorodissection include retinal stability at the time of vitreous removal, better visualization of vitreous and intraocular structures, rapid retinal reattachment, less blood in the vitreous cavity, subretinal fluid resolution, blood confinement, and easier dissection of epiretinal membranes.

The technique is the same for both TRD in PDR and ocular toxocariasis. However, all PDR cases (30 eyes) had perfluoropropane as intraocular tamponade, and all ocular toxocariasis cases (10 eyes) required silicone oil. The formation
of retinal breaks was not associated with the need for one tamponade compared with the other. Young age was the main reason to use silicone oil in the ocular toxocariasis cases. In both entities, the membranes were very adherent to the retina, and the separation of the fibrovascular tissue resulted entirely from the gentle injection pressure with PFCL. However, in some cases conventional pick and scissors may be needed to aid in membrane dissection.

I am currently using this technique with 23-gauge transconjunctival sutureless vitrectomy (23-G TSV, Alcon Laboratories) instrumentation in TRD cases. The combination of EBPFD, small-gauge vitrectomy, and preoperative intravitreal bevacizumab in PDR seems to improve our surgical results with faster BCVA recovery and more comfort for the patient.

In summary, this article reports the applicability of using EBPFD during vitrectomy in eyes with TRD in PDR and ocular toxocariasis. En bloc perfluorodissection seems to maintain the advantages of PCPV using a limited amount of perfluorocarbon liquid and a simple technique.

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